

REMARKS

In the Office Action dated October 17, 2005, the Examiner rejects claims 1-22 under 35 U.S.C. § 103(a). With this Amendment, claims 2, 4-9, 11, 13 and 18-21 are amended. No claims are added or canceled. After entry of this Amendment, claims 1-22 are pending in the Application. Reconsideration of the Application as amended is respectfully submitted.

Applicants herewith submit a Second Substitute Specification and a redline/strikeout version showing the changes from the Substitute Specification previously submitted. An amended Abstract is also included therein. The Second Substitute Specification filed herewith has been amended to utilize idiomatic English, correct minor typographical and grammatical errors and to conform the application to current United States Patent practice. The Second Substitute Specification includes no new subject matter. Applicants respectfully request approval of the Second Substitute Specification.

Applicants have made minor amendments to each of claims 2, 4-9, 13, 18, 19 and 21 to clarify the elements therein by correcting punctuation and typographical errors and/or by changing the form to more idiomatic English. It is respectfully submitted that each of these claims are allowable over the prior art of record as described below.

The Examiner rejects claims 1-7 and 10-12 under 35 U.S.C. § 103(a) as being unpatentable over European Patent Application No. 0 437 915 A2 (hereinafter EP '915). The Examiner states that EP '915 teaches a copper holding with a hafnium insert and a silver or silver alloy boundary layer separating the holder and the insert. The Examiner states that it is obvious that EP '915 teaches a graded transition between the elements barring further description of the same since the layer of silver is "metallurgically bonded." A minor error in claim 1 has been corrected to specify the "two metals or metal alloys" instead of the "two metals and metal alloys" as the latter language does not make it clear that there can be one metal and one metal alloys, two metals or two metal alloys.

Applicants respectfully submit that EP '915 does not teach or suggest all the features of claim 1 and its dependent claims. In claim 1 the present invention is formed by a core and a shell part having a boundary layer between a core surface and the shell part formed in a graded shape of solid solutions of the two metals or metal alloys of the core and the shell part. Alternately, an intermediate layer is formed from another one of metal and a metal alloy having a work function greater than that of the core material formed toward the core surface and toward the shell part with boundary layers in a graded transition. Thus, the claim specifies that in the event an intermediate layer is included, the boundary layer from the intermediate layer toward the shell part and the boundary layer from the intermediate layer toward the core surface are each in a graded transition. The process used to manufacture the inventive electrode is a method using compressive forces, such as extrusion molding or hot isostatic pressing.

In contrast, the reference describes that the sleeve 32, which can be silver, is metallurgically bonded to a cavity of the holder 16, which is preferably copper. (EP '915, p. 3, ll. 48-50). Such bonding is performed by inserting a disk 99 of silver brazing material into the cavity 22, inserting a silver blank 98 into the cavity 22, and heating the assembly to a temperature only sufficient to melt the brazing material while pressing the silver blank 98 into the cavity 22 such that the melted brazing material flows up and around the silver blank 98 between its surface and the surface of the cavity. This thin coating bonds the silver blank 98 to the cavity. (See p. 5, ll. 40-48). The silver blank 98 is drilled, and the emissive insert 28, which can be hafnium, is force fitted into the resulting opening as described at p. 5, ll. 51-52. Thus, neither the boundary layer between the sleeve 32 and the holder 16 nor the boundary layer between the sleeve 32 and the emissive insert 28 is in a graded transition as would be produced by compressive forces. In fact, compressive forces are not applied to the silver blank 98 that eventually forms the sleeve 32 and the holder 16; the melted brazing material flows to the gaps between the silver blank 98 and the cavity 22 through normal capillary action sped up by pressing the silver blank 98 into the cavity 22. Further, even if one were to argue that the metallurgical bond

formed between the silver blank 98 and the cavity 22 by the disk 99 of brazing material were in a graded transition, there can be no such graded transition between the sleeve 32 and the emissive insert 28 because the emissive insert 28 is merely fit into the sleeve in a mechanical fit. No graded transition is even possible under such circumstances, and no metallurgical bond is formed. For the foregoing reasons, claim 1 and its dependent claims, including claims 2-7, 10 and 11, are allowable over the prior art of record.

In addition to the foregoing, it is respectfully submitted that the Examiner has failed to make a *prima facie* case of obviousness with respect to the features of claims 7 and 10. Claim 7 specifies that the core includes a plurality of wire-shaped elements twisted with each other, but the Examiner states that this is an obvious design choice as the shape is dependent on the end use of the device. It is submitted, however, that motivation must come from the prior art, not the Applicants' own disclosure. Here there is no such motivation because there is no teaching or suggestion in the art, and particularly EP '915, that the end use of the plasma torch dictates the shape of the electrode. Further, the Examiner has also failed to show any prior art torch electrode that uses this shape. To the extent the Examiner is relying upon personal knowledge, in this instance it is improper. Finally, no person skilled in the art would be motivated to make such a change in EP '915 because of the presumably less secure and harder installation involved in fitting of a plurality of wire-shaped elements twisted together into the cavity 22 formed by drilling into the silver blank 98 over the circular emissive insert 28. Such an installation would also create debris-gathering gaps between the bonded sleeve 32 and holder 16 and the emissive insert 28. Thus, the invention of claim 7 is patentable over the prior art of record.

Claim 10 requires that the intermediate layer be formed from a powder, and the Examiner states that this is an obvious design choice considering the widespread use of the same in torch electrode construction. Applicants submit that even if the use of powder in torch electrode construction were widespread as suggested by the Examiner, this does not make such use an obvious design choice.

The proper inquiry for obviousness here is whether it would be obvious to form the intermediate layer using a powder, and Applicants respectfully submit that the answer to that inquiry is no. The layer that the Examiner has identified as the "intermediate layer" in EP '915 corresponds to the layer created by the silver blank 98. If the silver blank 98 were formed from a powder, the process used to manufacture the electrode in EP '915 would not work as disclosed. It is respectfully submitted that claim 10 is allowable over the prior art of record.

The Examiner rejects claim 8 under 35 U.S.C. § 103(a) as being unpatentable over EP '915 in view of Prucher. Claim 8 specifies that the core comprises one of a star-shaped cross-section, an annular cross-section and a cross-shaped cross-section. The Examiner states that Prucher teaches that a star shaped core is conventional so the artisan would have found it obvious to use such a shape in EP '915 depending upon the end use of the torch. It is respectfully submitted that Prucher teaches a spot welding electrode, which is substantially different from a plasma torch electrode as in spot welding, the size and shape of the electrode determines the size and shape of the spot weld. Further, like the plurality of wire-shaped elements twisted together in claim 7, no person skilled in the art would be motivated to include the star-shaped cross-section in EP '915 because of the presumably less secure and harder installation involved in fitting of such a shape into the drilled cavity 22 of the silver blank 98. Such an installation would similarly create debris-gathering gaps between the bonded sleeve 32 and holder 16 and the emissive insert 28. In any case, claim 8 is allowable over the prior art of record based upon dependence from claim 1.

The Examiner rejects claim 9 under 35 U.S.C. § 103(a) as being unpatentable over EP '915 in view of Lu et al. Claim 9 specifies that several cores arranged separately form the electrode. The Examiner states that Lu et al. teaches that parallel inserts are conventional so the artisan would have found this an obvious choice to use for the shape of the core in EP '915 dependent upon the end use of the torch. It is respectfully submitted that the Examiner has failed to identify, and the Applicants have similarly failed to locate where in Lu et al. parallel inserts are

described as conventional. In Lu et al., an electrode is taught that has a bore disposed in the end, where the bore can be cylindrical or ring-shaped for a corresponding insert. (Abstract). Cylindrical inserts are described as "typical" and "traditional". (Col. 1, ll. 37-39, 40-41). It is respectfully submitted that Lu et al. does not teach or suggest several cores arranged separately from the electrode. For the foregoing reasons, and based upon dependence from claim 1, claim 9 is available over the prior art of record.

The Examiner rejects claims 13-22 under 35 U.S.C. § 103(a) as being unpatentable over EP '915. The Examiner states that EP '915 teaches a copper holding with a hafnium insert and a silver or silver alloy boundary layer separating the holder and the insert. The Examiner states that it is obvious that EP '915 teaches a graded transition between the elements barring further description of the same since the layer of silver is "metallurgically bonded." It is respectfully submitted that the Examiner has not made a *prima facie* case of obviousness of claim 13 and its dependent claims. As described previously with respect to claim 1, EP '915 teaches bonding a sleeve 32, which can be silver, to a cavity of the holder 16, which is preferably copper, by inserting a disk 99 of silver brazing material into the cavity 22, inserting a silver blank 98 into the cavity 22, and heating the assembly to a temperature only sufficient to melt the brazing material while pressing the silver blank 98 into the cavity 22. (See p. 5, ll. 40-48). This pressing of the silver blank 98 merely speeds up the capillary flow into the spaces between the silver blank 98 and the cavity 22. In contrast, claim 13 requires that the electrode element be manufactured by applying compressive forces using one of a shaping method and a joining method. Applicants disclose that methods of manufacture that meet this requirement include, for example, extrusion molding and hot isostatic pressing. The only method of manufacture taught by EP '915 is brazing with an additional brazing material. This is not merely a change in manufacturing methods as the joined surfaces are significantly different as a result of compressive forces versus brazing. Claim 13 and its dependent claims 14-22 are allowable over the prior art of record.

Claim 14 recites the step of manufacturing said electrode element by one of extrusion molding and hot isostatic pressing, and claims 18 and 19 require extrusion molding. As mentioned above, nothing in EP '915 teaches or suggests this feature so claim 14 and its dependent claims 15 and 16, and claims 18 and 19, are allowable over the prior art of record.

In addition to the foregoing argument with respect to claim 13, from which claim 17 depends, it is respectfully submitted that EP '915 fails to teach or suggest the step of twisting several wire-shaped elements with each other for the formation of the core for the reasons stated with respect to claim 7. Thus, the invention of claim 17 is patentable over the prior art of record.

Claim 20 has been amended to clarify antecedent basis by removing the phrase "primary product" and by stating that the method further includes the step of manufacturing at least one of said sleeve-shaped part and said at least one core element by cold isostatic pressing. It is respectfully submitted that the Examiner has failed to identify this feature in the prior art so has failed to make a *prima facie* case of obviousness. For this reason, and based upon dependency from claim 13, claim 20 is allowable over the prior art of record.

Claim 21 recites the step of forming a contour on an outer circumferential surface of said shell part for a positive joint with a sleeve-shaped copper part. It is respectfully submitted that the Examiner does not point out this feature in the prior art and that the cited reference does not teach or suggest this feature. It is respectfully submitted that the invention of claim 21 is patentable over the prior art of record.

The Examiner states that claim 22 is unpatentable over EP '915. However, Applicants respectfully submit that nothing in EP '915 teaches or suggests the step of forming a single-sided open cavity within said shell part by backward extrusion. For this reason, and based upon dependency from claim 13, claim 22 is allowable over the prior art of record.

It is submitted that this Amendment has antecedent basis in the Application as originally filed, including the specification, claims and drawings, and

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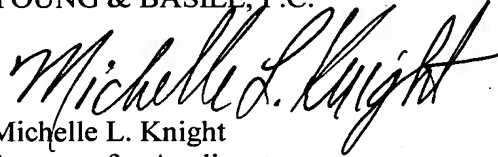
that this Amendment does not add any new subject matter to the Application.

Consideration of the Application as amended is requested. It is submitted that this Amendment places the Application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present Application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the Applicants' attorney at the telephone number listed below.

Respectfully submitted,

YOUNG & BASILE, P.C.

A handwritten signature in black ink, reading "Michelle L. Knight". The signature is written in a cursive, flowing style.

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